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INDUSTRIAL AND TECHNICAL TRAINING IN THE SECONDARY SCHOOLS AND ITS BEARING ON COLLEGE-ENTRANCE REQUIREMENTS

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To anyone interested in the development of the secondary schools, this problem of industrial and technical training offers a most inviting field of investigation. The rapidity with which the various forms of manual training are being introduced into the schools seems to indicate a rapid increase in the popular demand for this type of motor education; due, no doubt, to the fact that manual training, after a long period of struggle and experiment, has finally won a glorious victory and established beyond question the justice of its claims to a position in the curricula of both the primary and the secondary schools.

The statistics of the United States Bureau of Education show clearly that manual training is being introduced into the secondary schools at a rapidly accelerating rate (cf. *Report* for 1904, Vol. II, p. 2057). We there learn that, of 588 school systems in towns of 8,000 inhabitants and over, only 37 had introduced this work in 1890. Ten years later, this number had increased to 169; a gain of 132 in ten years, or 13 a year. From 1900 to 1903 this number increased to 322; a gain of 153 in three years, or 51 a year. In the single year from 1903 to 1904 the increase in this number was 89, making a total of 411 of the 588, in which this type of work was given.

These facts are, of course, familiar to everyone interested in the secondary schools. They are mentioned here sin ply because

it is important, in considering the question of the introduction of industrial and technical training, which are but extensions of manual training, to recognize at the start that the educative value of motor training of the right sort is no longer a matter of debate. Experience has now abundantly proved that this sort of training is capable of producing educational results of a high order. We have learned that this work does not consist in developing manual dexterity alone; but that it is one of the best, if not the only way, to build up in the child the ability to react promptly in any situation in which he is placed, to think more clearly and definitely than is possible without this work, and to form in him the habit of trying to see things as they really are.

Since the value of motor training has thus been proven by experiment, it is interesting to trace the reaction of these experiments on educational theory. For all real advance in education, like all real progress in science, is made by one and only one method; namely, the scientific method of theory and experiment and experiment and theory. Without this constant interplay between theory and experiment, nothing very definite results, and we are very prone to forget Lincoln's remark that a man's legs must be long enough to reach to the ground.

But to proceed. The older educational theory was like the atomic theory of Democritus and Lucretius. These philosophers conceived that the varied phenomena of the material world about them were produced by hard, round, indivisible particles, each possessed of so little individuality that the eye of man—nay, even the eyes of the gods—could not distinguish the one from the other. They were, in fact, so much alike that Herschel and Maxwell said that they bore all the ear marks of having been manufactured in the same mold. They were supposed to be inert and lifeless, and to react on one another in producing the complexity of natural phenomena the Lord only knew how. So in educational theory. Each individual was to become a Lucretian atom in the human world. He was to be hard, round, indivisible, possessed of no individuality, and able to react on other atoms—if at all—in a way not satisfactorily explained

by the theory. The type of this educated atom was the college-bred man; and, since all could not be completely manufactured by going to college, the best that could be done for those who must fall by the wayside was to grind off as many of their personalities as was possible in the time which they could devote to the process.

But recent experiments in science have driven us to the idea that the atom is self-active, and teeming with an incredible amount of life of its own. So that instead of imposing inactivity and uniformity on the atom on *a priori* grounds, we are now trying to liberate these atoms more and more in order that we may find out by experiment what they will do. Similarly with the human atom; and the manual-training experiments have been among the most useful in helping us to free this atom and to find out what it will do.

This fundamental change of attitude toward the atom has of necessity brought with it numerous important secondary conclusions. Since the self-activity of the atom is its fundamental characteristic, we see that an atom is a success in proportion as its activity is directed into right and useful channels; or, in other words, the success of an atom's education is measured by its ability to produce, rather than by its ability to reproduce the works and words of others. We have also learned that this ability to produce is developed solely by producing. That individuality is the most precious of human traits is also becoming clear. We have also begun to believe that a thing is not necessarily educationally useless, simply because it happens to be practically useful: and that we are not necessarily fostering ideals of the market place (assuming that such ideals are as low down as some suppose them) by making use of these useful things as objects of instruction and of construction.

Conclusions similar to those derived from the manual training movement are being reached by the psychologists as the result of their extensive investigations on children. Capital surveys of some of this work are given in O'Shea's *Dynamic Factors in Education*; Baldwin's *Development of Mind in the Child and in the Race*; Hanus' *Educational Aims and Educa-*

tional Values, and many others. This work has been of tremendous assistance not only in establishing the conclusions just stated, but also in determining under what conditions motor training is really educational.

We might spend many days discussing this work and its results. I assume that you are all familiar with them, or that you will soon become so. The particular result in which we are interested today is this: That there can no longer be any doubt that motor training is an essential part of every child's education; and that such training furnishes in many, if not in all cases a better basis for a sane education than that furnished by the older static type of work. Applying this conclusion to our subject, it seems to mean that, far from there being any psychological objection to the introduction of the extended forms of manual and industrial training into the schools, there is every encouragement for the step. Thus educational theory approves of the motor training, and declares it to be an essential part of every child's education.

Yet, notwithstanding this approval of this work from both the experimental and the theoretical side, and notwithstanding the fact that some forms of this work are being introduced at a rapid rate, we hear the cry on all sides that more of this work is needed. It is the same cry, whether it calls for more plumbing and bricklaying and carpentry, or for more concrete and practical work in physics and chemistry. The cry was so well voiced by Superintendent E. G. Cooley, of Chicago, last winter in an address before the Illinois Federation of Women's Clubs, that I cannot bring it better before the reader than by stating his argument. So far as I know, the address has not been printed, so this outline is from notes made at the time. It ran like this:

The content of education has been determined by its utility in all times and ages; for example, in the Middle Ages it was for the clergy; in the Reformation, its purpose was to teach the children to read *the* book. From these sources the ideal of books became dominant and has remained so. But executive instincts must be trained, not alone the receptive faculty. Educational schemes must connect with motor impulses. History shows that knowledge is sought primarily for practical ends. Hence the individual

must be educated in the lines along which society is moving, or he becomes a misfit. In the past, the high school has catered more to the colleges than to the public. It must now turn to the public and take up vocational work. Few things are more wasteful than work dominated by college ideals, for a student with practical tastes. The schools cannot be the people's schools under the present conditions because they refuse to recognize the educational value of making a loaf of bread or of drawing a gas engine, but only that of demonstrating an abstract proposition in mathematics.

This is characteristic of what seems to be a very general and constantly growing opinion, namely, that the present situation demands an extension of the motor work into industrial and technical, or what might be termed vocational lines. But there are two other lines of argument that lead to the same conclusion.

The first comes from the social side. The study of the rapid falling off in attendance at school after the fifth grade has led to some interesting conclusions. Thus Superintendent L. D. Harvey, of Menominee, Wis., at the last meeting of the Department of Superintendence of the National Educational Association said (cf. *Report for 1907*, p. 170) :

In every city of any considerable size there are a large number of children who do not complete the course of study in the elementary schools. . . . The recent report of the Massachusetts commission appointed by the governor to investigate this subject disclosed the fact that there were twenty-five thousand children in that state between the ages of fourteen and sixteen who were not in the public or the private schools, and that if they were employed in any gainful occupation, it was of the lowest class of unskilled labor, commanding a very low rate of wages, and with little or no prospect for advancement to a higher and better-paid class of labor.

Observation in almost any city will disclose conditions similar to those found in that state. The children have left the schools for a number of reasons. . . . They are not interested in the work of the schools; the immediate opportunity to earn even a few dollars a month appeals to them with greater force than do the problematical benefits of further schooling. In many cases this indifference is due to the fact that the character of the work in the elementary schools, making as it does little or no demand on the motor activities of the child, does not appeal to them. . . . Many of them, who do secure employment, enter upon it under conditions which are the worst possible, both for the moral and the physical development of the child. From this class a large number of the recruits come for our charitable and penal institutions later on. Such a class, lacking in opportunity, hope,

and aspiration, in an environment most depressing, is a menace to society and to the state. There will always be such a class, but the question which interests those who are interested in the welfare of society is: How large shall this class be?

. . . . In recent years educators have been studying this problem and a marked change is evident in their view of the inadequacy of our present educational system. They are coming to recognize that the fundamental thing in educational effort is to develop the capacity to earn a livelihood. Because further development along cultural or other lines is conditioned by the capacity of the individual to support himself, they are recognizing that this demands the introduction of industrial education in training young people to do something with their hands, as well as to know something of what other people have thought and done.

At the same meeting, Superintendent F. B. Dyer, of Cincinnati, said:

The reasons for stopping may be classified under two heads: necessity and inclination, and the latter is probably more general and fundamental than the former, for when the inclination to stop is strong, the necessity can readily be demonstrated.

Whether these statistics are representative or not (and I believe they are), all will concede that our great cities are permitting to develop a large proletariat whose rule is king mob. Many of these youths take minor positions, which they soon outgrow; but they get no farther, for they are fitted for nothing better. There is danger of their becoming loafers at eighteen and criminals at twenty. If they go to the factories, they are likely to make poor, incompetent workmen; the modern factory system scarcely allows of apprentices, and in the few remaining trades such apprentices are neglected, and the quality of the work degenerates. An industrial system that is largely recruited from the illiterate and incompetent, with no means of self-improvement, will not long be able to compete with the systems of other countries, whose rank and file are skilled and intelligent artisans, elaborately trained in the theory and the practice of their special vocations.

General industrial schools are necessary. From a study of foreign systems it appears that general industrial schools should be opened in our cities. They should admit pupils fourteen years of age upon very easy terms as regards scholarship.

Those who have not completed their elementary schooling (who, you will remember constitute three-fourths of the attendance) should continue in the most essential studies, but their promotion should depend on their advancement in industrial work. Attendance, either in day or evening schools, should be compulsory under 16, except as excused by central authority.

From quite another point of view we have another expres-

sion of the need of industrial and technical training in our elementary and secondary schools. In his convocation address at the University of Chicago last December, Hamilton Wright Mabie said (*University Record*, January, 1907, p. 89):

This is the age of the skilled man. The tragedy of the time, as I see it, is not the tragedy of the bad man or the bad woman—that tragedy is as old as history; but the special tragedy of our time is the tragedy of the “half-trained man” or the “half-trained woman.” It is the tragedy of the man who is willing to do anything that he can get to do, but who has no special facility for doing any one thing; or of the woman who is willing to do anything that is consistent with honor, but who has no training for any special kind of work. It is a tragedy of a desire to work, without training for dealing with the tools or the material.

There is only one man in our modern society, from the economical side, that is safe, and he is the man who can command his position by the superiority of his skill.

Hence it appears that more training in the schools in practical and strictly useful lines is being demanded, not only on educational grounds, but also on social grounds. For if there are 25,000 children in Massachusetts between the ages of 14 and 16 who are not in school, and who are either not employed at all, or working as the lowest class of unskilled labor without any future before them; and if a large number of recruits for penal and charitable institutions is derived from this class; and if the existence of this class is due in part to its members resenting the attempt of the schools to make either partial or entire clergymen of them (for the college course was originally designed for the clergy); then it is high time for the state schools to sit up and pay attention. These schools, if I am not very much mistaken, are established and supported by the state for the purpose of developing in the population the maximum degree of social sanity and economic efficiency. Hence, if the introduction of more industrial and technical work into these schools will add to their efficiency in accomplishing these ends—and there is a great mass of testimony tending to show that it will—no time should be lost and no effort spared till such work is established.

But there is a still larger aspect of this subject. For in our

modern world a state is not an isolated unit that can organize its affairs with utter disregard of the affairs of other states. The civilized world is today so bound together by ties of social and economic interdependence, that even a great nation like ours cannot with impunity refuse to observe and to take account of the actions of other nations when endeavoring to shape its own course. Applied to the practical problem before us, this means that we cannot afford to be blind to what is being done abroad in the establishment of industrial and technical schools for the training not only of head engineers and supervisors, but also of skilled hands to do the detailed work of manufacture.

The industrial and technical schools of Germany are now too well known to need description here. They have recently been treated at some length in Vol. XXXIII of the *Special Consular Reports* of our Department of Commerce and Labor. I would merely like to ask: How long may this country hope to compete successfully with Germany in the markets of the world for the sale of manufactured articles in whose making such skilled labor is required? Are our manufacturing interests of so little account that we, trusting largely to our native horse sense and good luck to make up for our lack of training, can afford to sit idly by while Germany and other nations are training thoroughly and carefully a great army of workers?

The federal and state governments seem to appreciate the value of industrial training in the case of agriculture, since agriculture is regarded as our most important national asset—and rightly so from the starvation and social points of view. These governmental authorities, as is well known, spend large sums annually on agricultural experiment stations and agricultural colleges. Yet the state schools have not yet waked up to the industrial situation in other lines, and comparatively little is being done for other kinds of industrial workers.

A comparative statement of the relative magnitudes of our agricultural and our manufacturing interests may not be amiss here. The figures are taken from the *Twelfth Census Report*, and give the conditions for the year 1900. In that year about ten million men, women, and children over ten years of age

were employed in agriculture in the United States. The total value of the produce was about five billion dollars, of which about one billion worth was fed to stock; so that the net value produced was about four billion dollars.

In the manufacturing enterprises the total number employed was about seven million, and the total value of the product was about thirteen billion dollars. The cost of materials and running expenses other than labor was about eight billion dollars: so the net value produced was about five billion dollars.

Hence in agriculture 10,000,000 produced \$4,000,000,000, and in manufactures, 7,000,000 produced \$5,000,000,000.

Still our schools are doing comparatively little for the manufacturing hands, notwithstanding the fact that industrial and technical studies have been proved to be capable of furnishing a splendid basis for school work—nay, even to be an essential part of it—and notwithstanding the further fact that the schools are now acknowledged to be up in the air looking for a headstone for the corner, when the stone that the builders rejected is lying in plain sight of all, and almost crying out for an opportunity to be of use.

I sincerely hope that what I have said will not be misinterpreted to mean that all our schools should be converted into industrial schools. This would, of course, be as foolish as the antique system of leaving all schooling to the clergy. What I do mean, however, is that motor training, including instruction in industrial processes, should be introduced into all the schools, and that a number of strictly industrial schools sufficient to meet the demand should be established.

That the demand would be large is shown by the large and flourishing correspondence schools that have sprung up as money-makers for individuals. These schools attempt to teach by correspondence to full grown men and women those industrial and technical subjects which the state should teach to them when children. The demand for this sort of instruction is so great that adults take this indirect and wasteful way of making up for their earlier shortage, pay for it from their own earnings, and doubtless also pay taxes to perpetuate for their children a

system that did not do its duty by them. It is stated on good authority that the number studying thus by correspondence is greater than the number enrolled in all the secondary schools and institutions of higher learning in the country.

In what has preceded the attempt has been made to show crudely that industrial and technical training is at present a crying need of our schools; first, because it has been proved by experiment to be capable of returns of a high order; second, because psychology and child-study have demonstrated that it is an essential part of everyone's education; third, because society demands it for the reduction of the idle class; and fourth, because the economic situation makes it imperative if we hope to retain our supremacy in the markets of the world. It would not be right to end this justification of motor training without at least stating its really final, all-inclusive, and complete justification. This comes from the side of philosophy. As it appears to me, the argument runs like this:

The governing factor in every man's action is the interpretation which he himself and of himself makes of the world about him. This interpretation consists in a system of beliefs which the man considers to be true. The highest function of the school is to help each individual in the formation of the best interpretation of which he is capable. I say *to help* purposely; for to construct an interpretation for someone else, or to impose it on him from without, is an utter impossibility. Interpretations are possible only when there are phenomena to be interpreted; and the basis of all real and vital interpretations is made up solely, in the last analysis, of the individual's own actual experiences with the concrete facts and phenomena of his own world. Hence the man who has had the broadest and most comprehensive series of experiences with facts and phenomena in the concrete is the one capable of the broadest and most comprehensive interpretation. Industrial operations are among the most fundamental of the possible concrete experiences of men. Therefore, for everyone a concrete experience with them is essential to the formation of an adequate world-interpretation.

Furthermore, a man's confidence in the truth or validity of his interpretation depends on his ability to use it in the correct prediction of future concrete experiences, and in the successful accomplishment of practical results in his concrete world. Hence, the wider a man's experiences with the concrete, the more extended the field in which he can test his interpretation, and the more comprehensive the truth in which he believes.

In order that industrial studies may furnish part of a man's data for his interpretation of the world, they must, of course, not be treated as mere handicrafts or trades. They must rather be presented as parts of that grand drama which is often called man's conquest over nature and over himself. When so presented, they become parts of the present world life, as well as parts of the world's history, because they have contributed to the present organization of society, and so are present in the finished product.

A very forceful statement of this same justification for the introduction of industrial work—applied science, let us call it—has been given by Henry James (the father) in his essay on "Morality and the Perfect Life." Speaking of our social institutions he says:

None of them is adequate fully to express man's spiritual unity, since the only adequate expression of that is the organization of the whole race in perfect fellowship, an organization not by human legislation, not by police, not by convention, but by God's legislation which is science.

It seems very much like jumping from the sublime to the ridiculous to take up now the latter portion of my theme—that topic, which, like Banquo's ghost, is always bobbing up serenely at most inopportune times to disturb the tranquillity of the feast—I mean the college-entrance requirements. Had it not been for this specter, the National Educational Association might have named its Committee on College-Entrance Requirements something else, and this present agitation for motor work might have been finished long ago. If we could but escape its blighting presence—so I have been told—our schools would soon begin to live normal lives and to turn out normal graduates.

I therefore hope that, in taking up this problem of industrial training, we may be able to get such a start on this specter that it will never be able to play the boggy man with us or to cause anyone sleepless nights with its fervid hocus-pocus. Let us start this new work new, and recognize that, from the point of view of the public high school, the college-entrance requirements are like the flowers that bloom in the spring—they have nothing to do with the case. The state schools owe this training to the people of the state for educational, social, moral, and economic reasons that cannot be gainsaid. Should they be deterred from this mission because there are still in some colleges a few doubting Thomae who question whether things can be useful and cultural at the same time?

College-entrance requirements have done an enormous amount of good to the school systems of this country, and they are admirable institutions when they are framed by those whose devotion to young people is greater than their devotion to their specialty. But all must agree that this is not always the case, and that the traditions of the Lucretian atom (*vide supra*) have often played a more prominent part in their formation than has the more modern knowledge of the self-active atom of today. So let us start right by acknowledging that, from the point of view of the public high school, the college-entrance requirements have no bearing whatever on the subject.

From the point of view of the private schools, the same is true. It is not incumbent on them, as it is on the state schools, to take any interest in this matter so long as their patrons are willing to pay for the college-entrance training.

From the point of view of the college, however, the matter is of great importance. If the schools are led to introduce this work because it is demanded by every line of argument, the colleges should be—and I am sure that they are and will be—the last to oppose or hinder the good work. Hence they will accredit all such work when it is well done, and will add to their own curricula studies which furnish the right sort of motor training for the college age suitably to complete the work of the other schools. This has, in a measure already been done

by the colleges; for schools of higher technical training already exist, and most of the colleges accept drawing and shop work as part of the work accredited for entrance.

In this connection it is interesting to note that in this country the founding of the higher schools has generally preceded that of the lower. The university and the college were founded first. Then came preparatory schools or academies, founded at first by private enterprise. Have you ever noticed that the United States Bureau of Education did not begin to gather the statistics of the public schools till 1882, ten years after it had begun to collect them from the private schools? That year it received reports from 263 public and 1,482 private high schools. In 1892, it received statistics from 2,812 public and 1,434 private schools, which shows how rapidly the number of public schools increased in the ten years after some of them became well established.

It looks as if the same course might be followed by the industrial schools. Technical colleges have been established. A number of technical and industrial schools have been founded by private enterprise. Is it not now time for the public schools to move?

The practical difficulties in the way of introducing this work are in many cases very great. Two, however, stand out as particularly hard to meet. These are first, the fact that public opinion is not yet fully educated up to the importance of the step. Though this difficulty is gradually decreasing, it will take some time yet before those of the public who especially need this training for social and economic reasons will be content with it, without looking longingly at the old-time college-entrance training as being in their opinion a little "sweller." The vainglorious striving after this old-time training by many children who particularly need the other sort is very pathetic; and in many cases it leads to the great tragedy of which Mr. Mabie spoke. Was it Mr. Dooley who rightly said: "They go to college to learn a lot of things that they don't want, and to want a lot of things that they can't have"?

The other serious difficulty is that of finding teachers com-

petent to do the work in a satisfactory manner. In surmounting this difficulty, the colleges, particularly those that have technical schools, can be of great service. But, they say, the colleges cannot begin training teachers for this work till there are places for them in the schools, and the schools cannot begin it till they can find the teachers; so neither does anything—particularly the colleges.

In solving this important problem, as in solving any scientific problem, the first step seems to be to gather together and to digest all the knowledge obtainable on the subject. The literature is now fairly large, and a number of experiments are in progress. Besides, there are the foreign schools to investigate. This information ought to be accessible to every primary and secondary and college man in the country. It seems certain that no very marked progress toward the solution of this problem will be made until a report no less complete than that of the Committee of Ten has been compiled. The work of drawing up such a report should be undertaken by the federal government, since the matter is really of national importance, or by some national organization that is capable of getting a sufficiently broad and representative consideration of both the industrial and the educational sides of the question.

No solution of the difficulties involved in this problem is attempted here, since such solutions would clearly be out of place before the appearance of a suitable report on the conditions which must be met. Numerous recent events tend to show that the public is waking up to this problem: how long must we wait for the much-needed report?